



Northern California Regional Integration of Renewables

Assessment of Northern California Sub-Regional Renewable Transmission Integration Priorities Beyond 2010

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PG&E – RIR Lead

Core Analysis Team:

CEC: Pete Spaulding, Michael Kane, Angela Tanghetti

CPUC: Brian Schumacher

CAISO: Gary DeShazo, Larry Tobias

LLNL: Dora Yen-Nakafuji

SMUD: James Leigh-Kendall, FOUNG Mua, Joe Tarantino

PG&E: Kang Ling Ching, Ben Morris, Chifong Thomas

TANC: Larry Gilbertson, Brian Griess, Dave Larsen, Monte Meredith

WAPA: Phil Sanchez, Kirk Sornborger





Topics

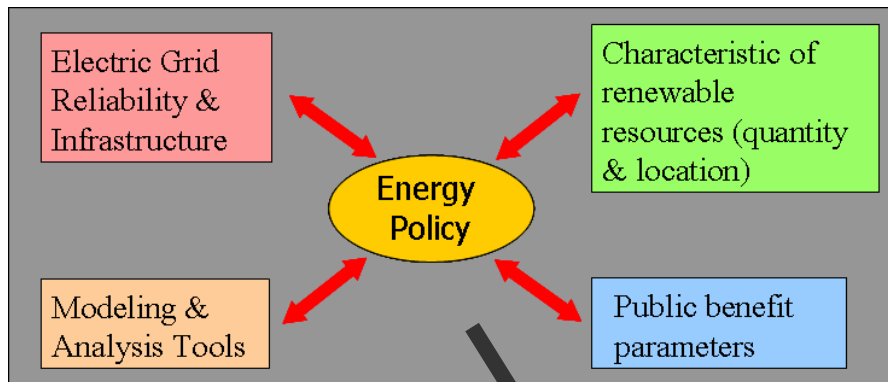
1. Background
2. Regional Integration of Renewables (RIR)
 - a. Structure
 - b. General Concept
 - c. Methodology
 - d. Schedule
 - e. Progress to Date
3. Q and A



Recently Completed Renewable Integration and Transmission Projects

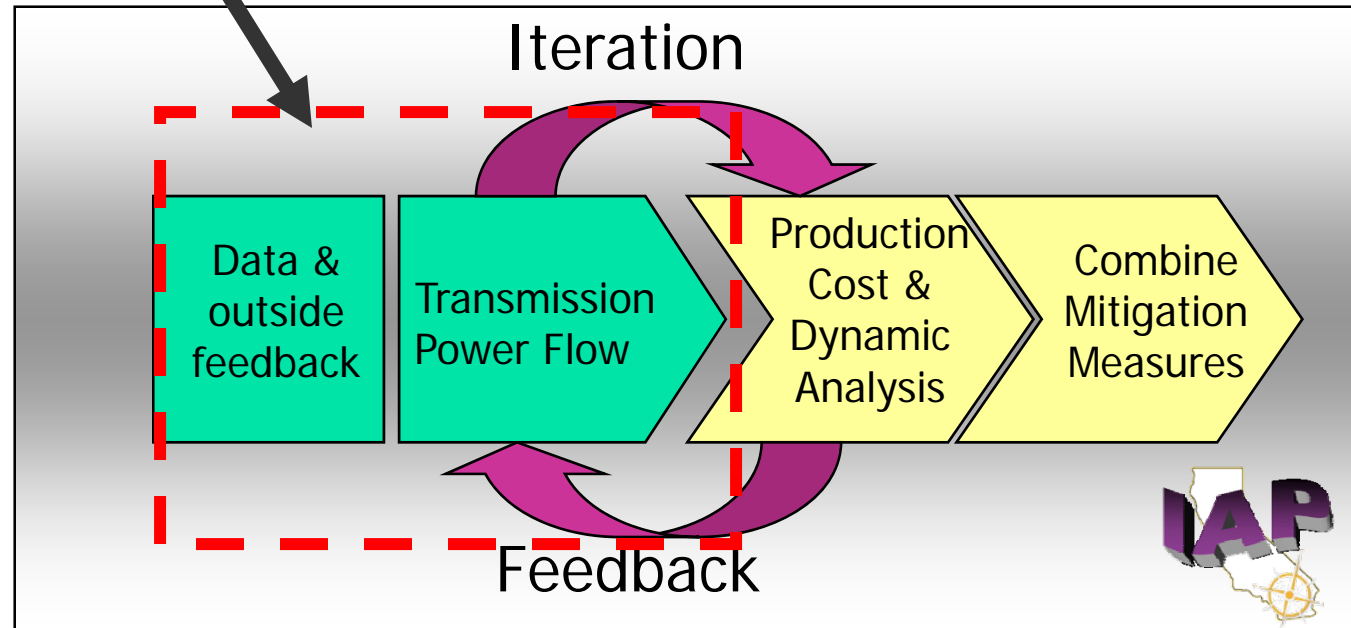
- Strategic Renewable Resource Assessment
- Tehachapi/Imperial Working Group
 - Facilitate development of transmission alternatives for wind resources
- Intermittency Analysis Project (IAP)
 - 2010 and 2020 renewable mixes
 - Quantify impacts of variability
- Utility Concerns & Operating Impacts
 - Operator interviews
 - Matrix of recommended transmission study areas
- Federal Transmission Corridors Study
- Climate Change Scenarios Study

IAP - Linking Potential to Operations



Strategic Renewable Resource Potential and Transmission

Operational Response & Grid Reliability Management





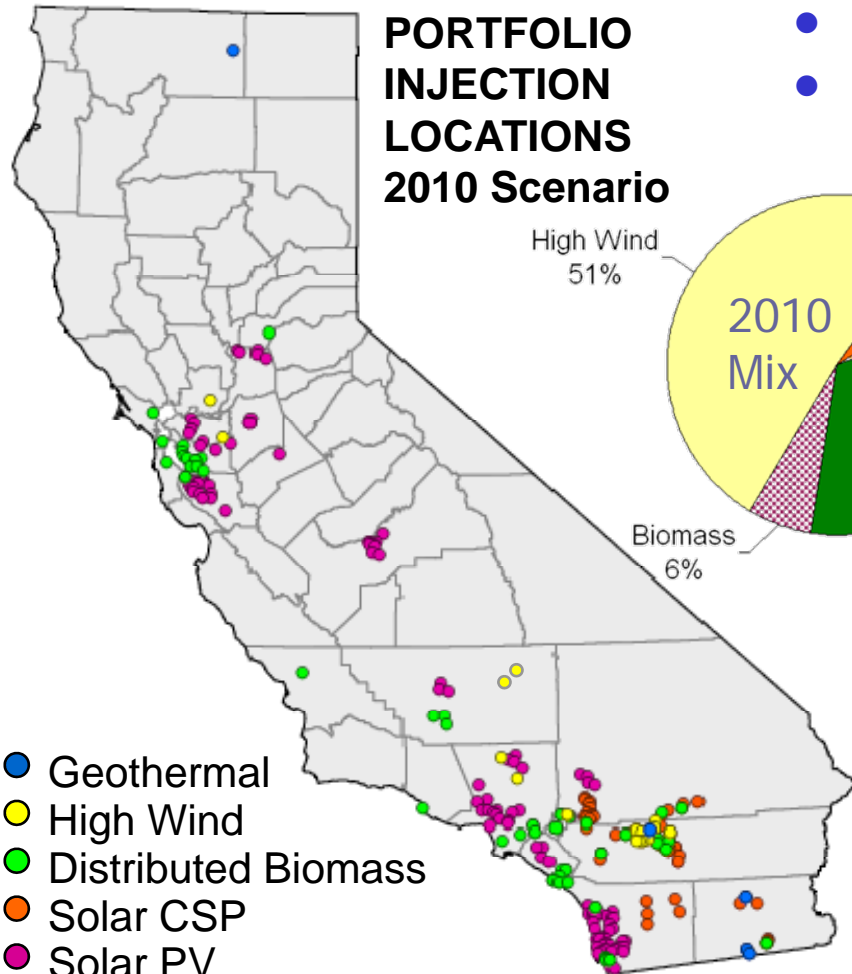
IAP Project Tasks

- Report: Impact of Past, Present & Future Wind Technologies on Transmission & Operation
- Four study scenarios
 - 2006 Base Case
 - 2010 Tehachapi with 3,000MW of wind in Tehachapi
 - 2010 Accelerated Case: theoretical “stepping-stone” case for building to 2020 alternatives
 - 2020 Case – 33% penetration
- Lessons learned from the international experience
 - Europe and Asia

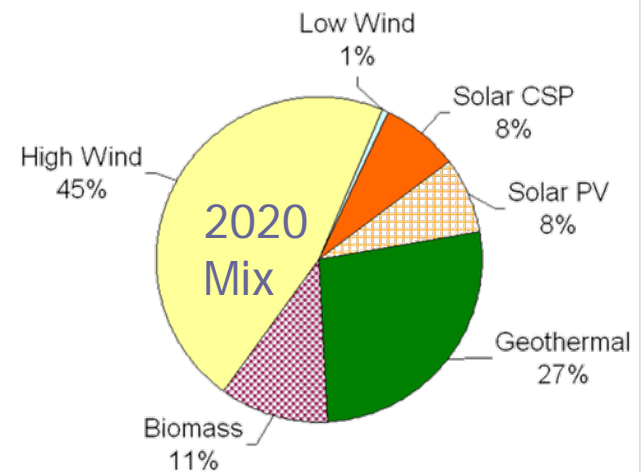
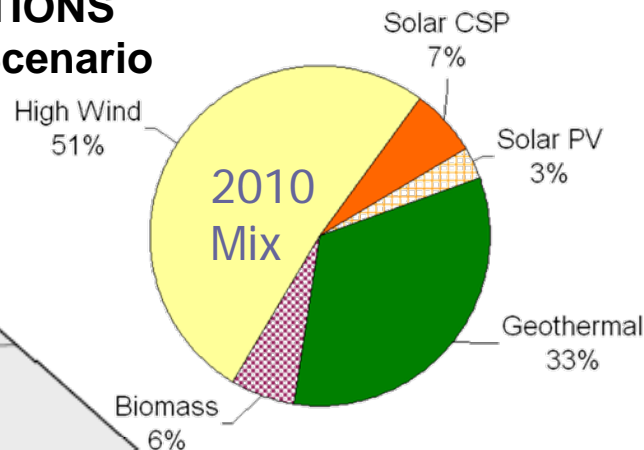
IAP – 2010 and 2020 Scenarios

Final Project Report: CEC-500-2007-081

STATEWIDE PORTFOLIO INJECTION LOCATIONS 2010 Scenario



- 20% renewable generation
- Portfolio mix of resources
- 3000 MW of wind at Tehachapi



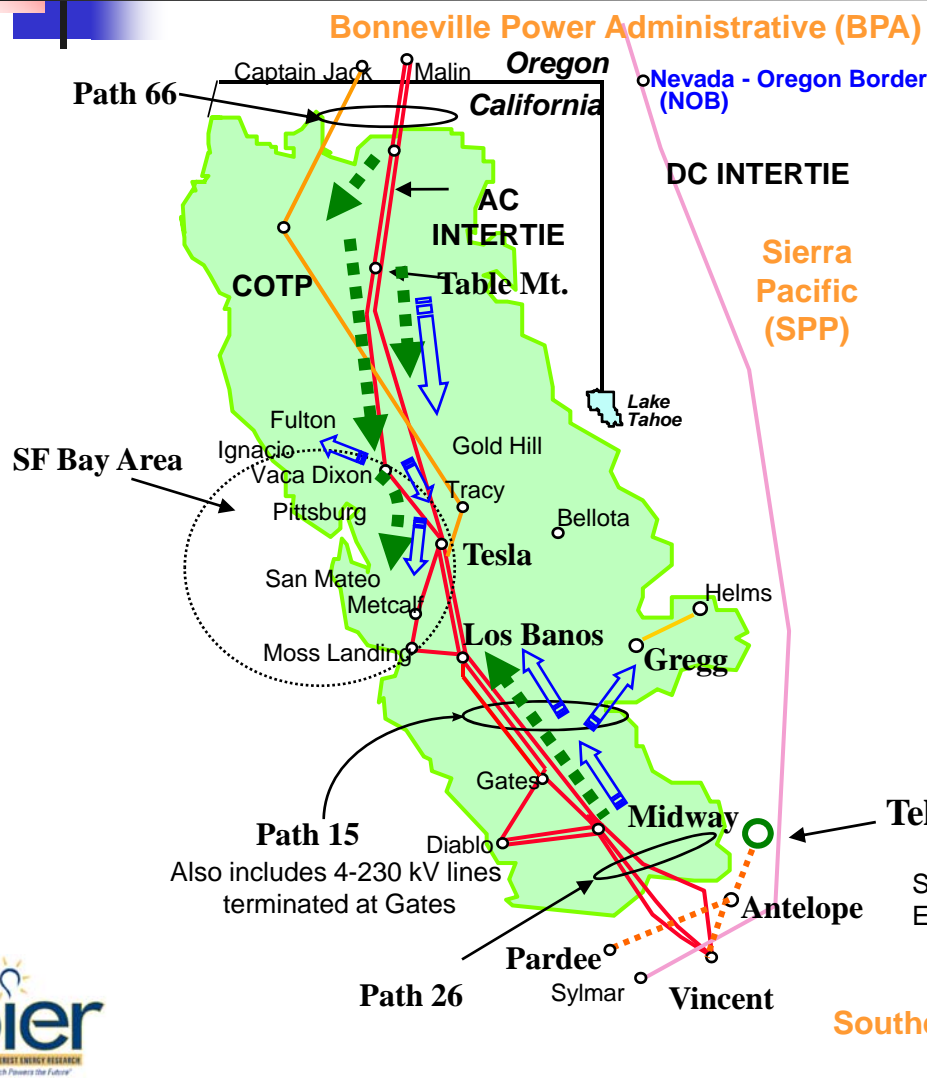
- 33% renewable generation
- Portfolio mix of resources



Next Steps: Integrated Sub-Regional Focused Studies

- Leverage statewide studies and scenarios to develop transmission strategies specific to utility needs, regional resources and transmission priorities
- Support utility-led efforts to study renewable integration and transmission reliability impacts to California

Promoting Multi-purpose Transmission Projects to Reduce Customer Risk/ Increase Customer Benefits



Existing Path Ratings

	North-to-South (MW)	South-to-North (MW)
Path 66	4,800	3,675
Path 15	3,265	5,400
Path 26	4,000	3,000

- Corridors identified in Transmission Expansion Plan
- Corridors identified in Transmission Ranking Cost Report



RIR - Structure

- ❑ Project Advisory Committee (PAC)
 - All Interested Stakeholders
 - Regular conference calls
 - Public workshops and reviews on findings and progress

- ❑ Core Analysis Team (CAT) - Contribute staff, conduct studies
 - CEC: Pete Spaulding, Michael Kane, Angela Tanghetti
 - CPUC: Brian Schumacher
 - CAISO: Gary DeShazo, Larry Tobias
 - LLNL: Dora Yen-Nakafuji
 - SMUD: James Leigh-Kendall, FOUNG Mua, Joe Tarantino
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RIR - General Concept

- Laying a solid technical basis for renewable integration
 - Conceptual transmission
 - System reliability across multi-utility service areas
 - Preliminary route and engineering studies for cost estimates
- Will not cover:
 - Contractual issues
 - Cost allocation
 - Commercial arrangements



RIR Vision: Flexible Options for Long-term Transmission for Northern California

- Reliably serve load
- Lowest possible cost to customers in an environmentally responsible manner
- Enhance market efficiency,
reduce congestion where cost effective
- Connect renewable resources
- Maintain flexibility in developing transmission plans
- Address GHG & planning retirements of older units



RIR - Objective

Facilitate proactive transmission system planning to articulate a “least regrets” transmission expansion approach for the northern California region

- Informs planners of network transmission expansion options that may be common to multiple generation resource development scenarios

AND

- Conceptualizes transmission scenarios beyond the confines of single transmission owners in northern California for 2015 - 2020 and beyond



RIR - Study Data & Technical Information

- Network Topology and Load
 - Based on latest available WECC and CAISO base cases
 - Renewable resource locations
- Resources Information
 - CEC Reports & other statewide, regional & local studies
 - Stakeholder input



RIR - Proposed Methodology

- Develop resource scenarios based on sound transmission planning principles to supply projected demand in California based on information available, i.e. CalISO, CEC, other transmission working groups and the WECC for 2015 - 2020 and beyond
- Develop transmission planning base cases covering peak (summer) and off-peak (winter) and other seasons as necessary (light spring)
- Develop transmission options for each resource scenario to supply projected load
- Analyze each option using transmission planning programs to develop conceptual transmission upgrades
- Identify the network transmission upgrades that are common to more than two resource scenarios



RIR - Proposed Methodology (cont.)

- Run sensitivity with projected load increased and decreased by X%
- Consider impact of varying climate conditions if applicable, i.e. hydro variation, carbon footprint reductions
- Develop reconnaissance-level cost estimates for each transmission upgrade
- Rank the transmission upgrades based on:
 - Estimated cost
 - Ability to support the most economic scenarios
 - Ability to support large number of resource scenarios
- Develop preferred ranking of network transmission upgrades



RIR - Schedule

<input type="checkbox"/> Determine scenarios and base case preparation	3 - 4 months
<input type="checkbox"/> Identify transmission problems	1 month
<input type="checkbox"/> Formulate potential solutions	3 - 4 months
<input type="checkbox"/> Preliminary check and cost estimate including engineering/land	6 - 9 months



RIR - Progress to Date

- Kick-off Meeting at CEC on 10/2/07
- Stakeholder Conference calls
 - 1st Tuesday of every other month from 11 a.m. – 12 noon
 - 1st Stakeholder Conference – 2/5/08
 - 2nd Stakeholder Conference – 4/1/08, 4/7/08
 - 3rd Stakeholder Conference – 6/3/08
- Websites for more project information:
www.pge.com/RIR and www.energy.ca.gov



RIR - Progress to Date

Developing base-line base case for 2020

- 2017 summer base case with loads scaled to 2020 using CEC EAO forecasts
- Two 2020 summer base cases:
 - Existing renewables as of March 31, 2008
 - Renewable mix expanded to include northern California portion of the 3,000 MW of residential PV and contracted renewables in northern California published as of April 4, 2008
- 2020 spring and fall to come later



Complementarity of RETI and RIR

RETI: focused on access to CREZs

- project-level assessment approach for developable renewables
- will recommend short-list of top-priority CREZs
- RIR could use RETI recommendations to construct additional generation development scenarios

RIR: focused on network transmission facilities

- multi-benefit “least regrets” approach
- will develop preparatory transmission planning base cases
- RETI could consider RIR preferred network transmission upgrades when developing conceptual transmission plans for identified CREZs